



# UNITED STATES PATENT AND TRADEMARK OFFICE

*ca*  
UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,767	06/27/2003	Takeshi Nishimura	4296-164 US	7413

7590 04/06/2007  
Diane Dunn McKay, Esq.  
Mathews, Collins, Shepherd & McKay, P.A.  
Suite 306  
100 Thanet Circle  
Princeton, NJ 08540

EXAMINER
----------

PUTTLITZ, KARL J

ART UNIT	PAPER NUMBER
----------	--------------

1621

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/06/2007	PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/607,767

Applicant(s)

NISHIMURA ET AL.

Examiner

Karl J. Puttlitz

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 March 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

KARL PUTTLITZ  
PATENT EXAMINER

3/16/2007

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 3/16/2007.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1/29/2007 has been entered.

The rejection of claims 2 and 13 under section 112, second paragraph is withdrawn in view of the amendments providing antecedent basis for the term "the concentration of maleic acid". Claim 13 has been canceled.

The rejection of claims 1-11 under section 103 is maintained and repeated below. The examiner notes the obvious typo in the outstanding Office Action rejecting the claims under 102. Applicant's remarks in connection with this ground of rejection are also addressed.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

Art Unit: 1621

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-11 rejected under 35 U.S.C. 103(a) as being unpatentable over U.S.

Patent No. 6,252,110 to Uemura et al. (Uemura) in view of The Kirk-Othmer

Encyclopedia of Chemical Technology, pp. 342-369, Copyright © 1991 by John Wiley &

Sons, Published Online: 4 Dec 2000 (Kirk Othmer) in view of U.S. Patent No. 6,409,886

to Matsumoto et al. (Matsumoto).

Uemura teaches that a production method of high purity acrylic acid normally consists of an oxidation step for producing acrylic acid through gas-phase catalytic oxidation of propylene and/or acrolein; a collection step of contacting the acrylic acid-containing gas with water and collecting the acrylic acid in the form of an aqueous acrylic acid solution; an azeotropic separation step of distilling the aqueous acrylic acid solution in an azeotropic separation column in the presence of an azeotropic solvent and recovering crude acrylic acid from bottom part of said column; and a purification step of purifying the crude acrylic acid. This purification step is normally conducted using a high boiling impurities separation column for removing high boiling impurities in the crude acrylic acid and optionally an acetic acid separation column for further removing acetic acid. See column 1, lines 49-63.

This patent also teaches introducing bottom liquid a thin film vaporizer into a pyrolyzing tank, decomposing acrylic acid dimer in a bottom liquid and thereafter recirculating at least a part of bottom the liquid of said pyrolyzing tank into said thin film vaporizer and/or the distillation column. See column 3, lines 36-44.

Fig.1 shows tanks in the process.

Uemura fails to explicitly teach introduction of a polymerization inhibitor to those distillation columns listed in the claims. Also, Uemura fails to teach those embodiments wherein the acrylic acid that is converted to polyacrylic acid or esters of acrylic acid. It is for this proposition that the examiner joins Kirk Othmer. Specifically, the reference teaches that free-radical polymerization inhibitors are fed to purification units to prevent polymer formation and resulting equipment failure, see page 354. Also the reference teaches that acrylates are primarily used to prepare emulsion and solution polymers, see abstract. In this same regard, Matsumoto teaches that a polymerization inhibitor is to be dissolved in the easily polymerizable compound or in a solvent to form a solution, and the solution is to be put into a supply line of the feed liquid, reflux liquid, or bottom circulation liquid or to be directly supplied into the distillation unit. In this connection, the bottom circulation liquid generally comprises relatively large amounts of a polymerization inhibitor directly supplied to the distillation unit, and can be returned to the distillation unit and sprayed without the addition of another portion of the polymerization inhibitor. See column 4, lines 13-27.

Matsumoto also teaches that the spray liquid is sprayed, by the spraying and supplying means (sprayer) to the constitutive member in the distillation unit to evenly wet the overall surface of the constitutive member. Conditions for spraying such as the type (species) of the spray, the number of nozzles, and a flow rate can be appropriately set according to, for example, the position (location) of the constitutive member, and the operating condition in the distillation unit. At least, the conditions should be preferably

Art Unit: 1621

set to wet the overall surface of the constitutive member as evenly as possible. See column 4, lines 37-47.

Matsumoto teaches various points of introduction: The spraying and supplying means 9 has four spray nozzles. FIG. 5 shows a process of spraying and putting a feedstock liquid into a downcomer 10a below a tray 10 of a plate distillation column. In a process shown in FIG. 6, a chimney 11 is provided to withdraw a liquid at some midpoint in a distillation column, and a portion of the withdrawn liquid is returned to the distillation column and is sprayed to the chimney 11 by a spraying and supplying means 12. FIG. 7 illustrates a process of spraying a liquid by a spraying and supplying means 17 to a supporting member 16 of a packed bed 15 in a packed distillation column 14. FIG. 8 shows a process of spraying a liquid by a spraying and supplying means 25 to an agitator 21, a baffle 20, and a manhole 26 in a reactor for reactive distillation. In these figures, each of the reference numerals 6 and 13 represents a pump. FIGS. 3 to 8 show embodiments of not only the inhibition of polymerization of a liquid formed by the condensation of a vapor in a vapor phase portion but also the inhibition of polymerization by dropping the spray liquid to a liquid phase portion to move the liquid thereby to shorten a retention time of the liquid on the surface of a constitutive member. See column 5, lines 30-51.

In connection with the above, Matsumoto provides the following figures which show introduction at the required points in a column:

FIG. 1

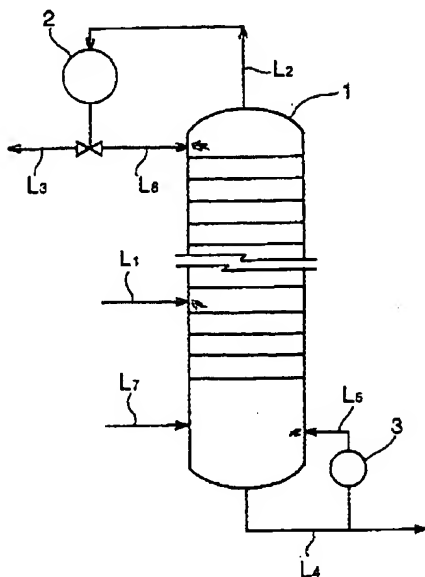


FIG. 4

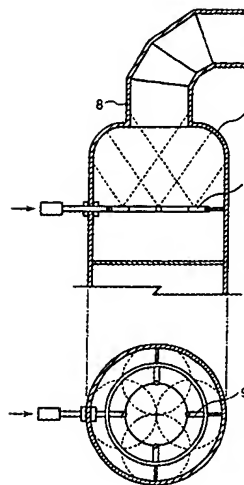


FIG. 3

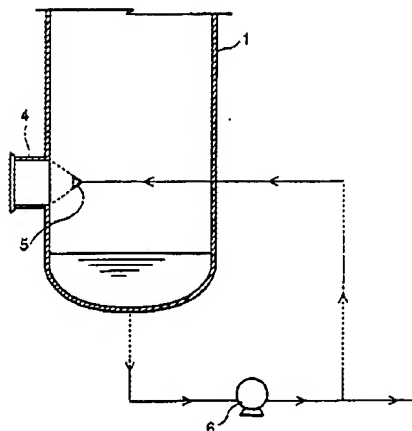


FIG. 5

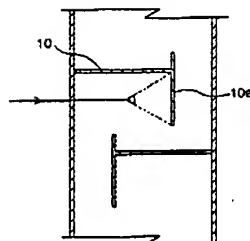


FIG. 6

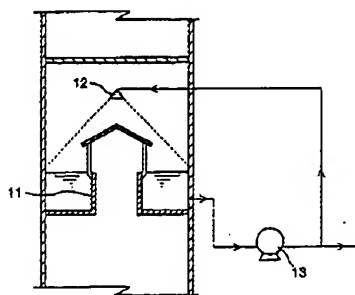


FIG. 7

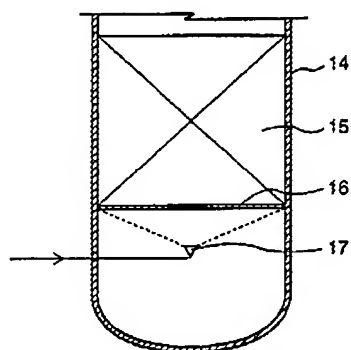
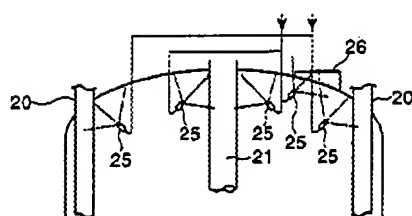


FIG. 8



Accordingly, those of ordinary skill would have been motivated to modify Uemura and Kirk-Othmer to include introduction of a polymerization inhibitor at the points required by the claims since Matsumoto teaches that introduction of these points is commonplace, and thus, well within the motivation of those of ordinary skill. Therefore, the rejected claims are prima facie obvious in view of the combination of Uemura, Kirk-Othmer and Matsumoto since these references teach or suggest the elements of the rejected claims with a reasonable expectation of success.

Applicant argues that Uemura et al. do not teach or suggest the step of supplying the acrylic acid recovered by thermally decomposing an acrylic acid oligomer to an azeotropic dehydration column. Applicant then argues that neither Kirk-Othmer nor Matsumoto remedy the deficiencies of Matsumoto in teaching the step of supplying the



Art Unit: 1621

acrylic acid recovered by thermally decomposing an acrylic acid oligomer to an azeotropic dehydration column. However, Uemura teaches supplying the acrylic acid recovered by thermally decomposing an acrylic acid oligomer to an acrylic acid recovery column, see for example, column 2, lines 59+. With regard to the dehydration column, Uemura teaches supplying the decomposed product to an acrylic acid recovery column, which read broadly, can include columns such as a dehydration column. The record is absent any comment on 1) why the column supplied with the decomposition material in Uemura is not a dehydration column, and 2) why recirculation to dehydration column is unexpected in view of Uemura.


### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karl J. Puttlitz whose telephone number is (571) 272-0645. The examiner can normally be reached on Monday to Friday from 9 a.m. to 5 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Thurman K. Page, can be reached at telephone number (571) 272-0602. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 1621

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



KARL PUTTLITZ  
PATENT EXAMINER

